1983 VERMONT SPRUCE BUDWORM SUPPRESSION PROJECT SUMMARY

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August 1983

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ABSTRACT

Thuricide 32 LV, Bactospeine FC and Dipel 6L, formulations of Bacillus thuringiensis, were each operationally applied to 18, 8 and 6 blocks, respectively, totaling 640, 659 and 413 acres. The formulations were each applied at 12 BIU per acre and 96 fl.oz. per acre on a total of 1712 acres. Applications were made with a small fixed-wing aircraft equipped with flat-fan nozzles. Spray deposit averaged 17, 9 and 13 colonies per cm^2 respectively, with thuricide, bactospeine and dipel. Except for the bactospeine treatments, insect reductions 30 days after spraying did not exceed reductions in the unsprayed checks but foliage saved exceeded 60 percent for each treatment.

SPRAY BLOCKS

A total of 32 blocks ranging in size from two to 180 acres and averaging 54 acres were selected for treatment primarily on the basis of high hazard ratings derived from data on budworm damage and predicted infestation levels. All blocks belonged to private landowners. Since the spray blocks occupied three separate geographical areas in northeastern Vermont, they were treated as three areas operationally. Number of blocks per town by geographical area was as follows: (1) Greensboro area: 10-Greensboro; 2-Albany; 1-Craftsbury; 1-Wheelock; 1-Stannard; 4-Hardwick; (2) Lyndon area: 3-Lyndon; 3-Burke; and 1-Sutton; (3) Morgan area: 2-Morgan; 2-Charleston; 2-Holland.

The primary objective of the suppression project was to prevent tree mortality by preserving at least 40 percent of the current foliage.

SPRAY TREATMENTS

Since this was Vermont's first suppression project for spruce budworm, it was decided to try the recommended commercially available Bacillus thuringiensis (B.t.) product from each of the three companies currently manufacturing such products. This would enable us to evaluate the comparative handling,

mixing, application and efficacy of each product. The three products chosen were Thuricide 32 LV, Bactospeine FC and Dipel 6L. These were applied to 18, 8 and 6 blocks respectively, comprising 640, 659 and 413 acres, for a total of 1712 acres treated. Each formulation was applied at the rate of 12 BIU per acre and 96 fl.oz. per acre, with the addition of 2% (by volume) Rhoplex AC 33 NP sticker. Except for Block 32 (Withers) in Greensboro, which was treated with bactospeine, all blocks in the Greensboro area were treated with thuricide. All blocks in the Lyndon area received bactospeine, while those in the Morgan area received dipel.

All applications were made 1, 2 and 3 June using a Piper Brave fixed-wing aircraft equipped with flat-fan (size 8004) nozzles. Swath width was 100 feet, flight speed was 110 mph, and pump pressure was 50 psi. Spray blocks were marked with helium-filled weather balloons and a spotter plane monitored the application and directed the spray pilot. Spruce budworm larvae were predominately in the fourth instar at the time of application.

SPRAY DEPOSIT, DEFOLIATION AND POPULATION ASSESSMENT

Spray blocks to be monitored for spray deposit, defoliation and population levels were selected on the basis of size and accessibility. Spray blocks less than 30 acres in size were not evaluated. Fourteen of the 32 blocks qualified for evaluation.

Five sample trees were selected at three to five chain intervals for each of the 14 blocks monitored. Sample trees were located perpendicular to the flight direction of the spray plane if this was known or was obvious. Otherwise, sample trees were located along a diagonal transect of the block. Dominant or codominant balsam fir trees were selected except where only spruce was available. One mid-crown 18" branch tip was collected per tree just prior to or on the day of spraying to determine prespray numbers of larvae.

Spray deposit was monitored by 2" x 3" Ciba-Geigy water sensitive cards as well as millipore filters in order to compare the two systems. Each card and filter were stapled to a 4" x 6" index card which was clipped to the top of a wire support and placed in an opening nearest each sample tree.

Spray deposition on water sensitive cards was determined by averaging the number of droplets visible within 1 cm^2 by use of a 5x magnifier for four randomly selected spots per card. Spray deposition on millipore filters was evaluated by incubating these on tryptocase-soy agar and counting the total number of colonies per filter.

Postspray sampling was conducted about 30 days after treatment when 90 percent of the insects were pupae or prepupae so that larval counts and defoliation estimates could be made at the same time. One 18" mid-crown branch per tree was collected for counts of larvae and pupae and for defoliation estimates. Defoliation was estimated by recording the Fettes defoliation class for 20 current shoots per branch. Under this procedure, mined buds were tallied as 100 percent defoliation.

Data for checks was obtained from untreated research plots near the spray blocks that were sampled by University of Vermont personnel under the direction of Dr. Bruce Parker. This data is based on 25, 18" branch tips per block.

RESULTS AND DISCUSSION

Spray deposit on water sensitive cards averaged 11, 16 and 9 droplets per cm^2, respectively, for the thuricide, bactospeine and dipel treatments (Table 1). Number of colonies per cm^2 on millipore filters averaged 17, 9 and 13, respectively, for the same three treatments (Table 1). All cards and filters had some spray deposit but average spray deposition by either method does not appear to correlate well with efficacy as measured by larval reduction or defoliation. Results by the two different systems were not as comparable as one would hope for. Some water sensitive cards that were exposed to dampness, such as that caused by heavy dew, turned completely blue making it impossible to detect the smallest droplets. Brief showers of any duration also negate their usefulness. These problems can be eliminated by the use of millipore filters but these must be transferred to nutrient agar soon after collection or refrigerated in the meantime.

Prespray and postspray insect counts and peak defoliation averages for each block monitored are listed in Table 2. Only one spray block exceeded

our goal of at least 40 percent foliage protection and it did so by only three percentage points. In the three blocks where 1982 defoliation was also measured, it averaged 54 percent compared to 35 percent following spraying in 1983. Defoliation averages for the checks are not yet available but general observations indicate greater defoliation outside the boundaries of most spray blocks.

Treatment effects are summarized in Table 3 and show that peak defoliation averaged 37-39 percent regardless of the product used. Insect counts summarized in terms of percent reduction show that only the bactospeine treatments resulted in a greater reduction in the numbers of insects 30 days after spraying than occurred in the checks.

Table 1. Spray Coverage on Water Sensitive Cards and Millipore Filters

Treatment	Block	No. of droplets per cm^2 on cards	No. of colonies per cm^2 on filters
Thuricide 32 LV	1	7.8 [1]	22.7
	3	9.0	20.7
	4	23.8	23.5
	9	10.2	12.0
	14	8.0	8.8
	23	8.8 [1]	16.4
	Mean	11.2	17.4
Bactospeine FC	19	7.8	5.0
	20	7.2	9.5
	25	3.0	3.6
	28	58.0	17.8
	32	5.4	1.5 [2]
	Mean	16.3	9.0
Dipel 6L	15	11.0	15.5
	18	10.0	17.9
	33	6.3	6.2
	Mean	9.1	13.2

1. Cards turned blue from moisture-difficult to detect all droplets.
2. Filters delayed for several days at room temperature-excluded from the mean.

Table 2. Prespray and Postspray Spruce Budworm Counts and Peak Defoliation by Spray Blocks

Treatment	Block	Owner	No. of larvae/18" branch Prespray	30 days Postspray[1]	Peak percent defoliation[2]
Thuricide 32 LV	1	Jaffin/Fontaine	4.8	2.2	25
	3	Jaffin/Demazo	9.6	7.4	40
	4	Jaffin/Stone	12.2	8.2	46
	9	Massey	30.8	4.8	35 (45)
	14	Peters	14.6	6.2	36
	23	Beagle Club	13.0	8.2	39 (65)
Bactospeine FC	19	D. Lussier	3.0	2.8	63
	20	Chieppo/Wheeler	15.4	2.4	28
	25	McCormack	65.6	4.4	46
	28	R. Lussier	4.0	0.0	4
	32	Withers	16.2	3.0	31 (52)
Dipel 6L	15	Slade	12.2	4.2	34
	18	Moulton	4.2	3.2	44
	33	Walker	6.8	1.8	33
Checks	12		13.0	2.5	70
	17		9.2	2.9	58
	34		15.5	4.0	48
	CB	F&G	6.5	1.9	24

1. Postspray survey includes pupae.

2. Numbers in parenthesis indicate 1982 defoliation on the same branches.

Table 3. Summary of 1983 Spruce Budworm Suppression Project Efficacy by Treatments

Treatment[1]	No. of blocks sampled	Percent insect reduction (30 days)	Mean percent defoliation
Thuricide 32 LV	6	56.3	37
Bactospeine FC	5	88.0	39
Dipel 6L	3	59.7	37
Checks	4 (3)	74.8 (75.4)	50 (59)[2]

1. 12 BIU/acre at 96 oz./acre.

2. One block (CB) had atypically light prespray damage compared to most spray blocks. Dropping this block would result in an average check defoliation of 59% and insect reduction of 75.4%.